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LSI CORPORATION
1621 BARBER LANE
MS: D-106
MILPITAS, CA 95035

| EXAMINER | |
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| LE, QUE TAN | |

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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Application Number: 10/628,614
Filing Date: July 28, 2003
Appellant(s): YOUNG ET AL.

L. Jon Lindsay
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed April 11, 2006 and the amended appeal brief filed September 10, 2007 appealing from the Office action mailed December 1, 2005.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

| | | |
|---|---|---|
| 6,906,794 | Tsuji | 6-2005 |

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 4 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsuji 6,906,794.

Tsuji discloses a semiconductor wafer inspection system comprising: an image capturing device (60, 74, 100, a microscope with a review system) to view at least a portion of an edge of the wafer (2) and generating a plural images of the edge of the wafer; a database (75, 76, 77, 78) receiving the generated images and storing the received images for subsequent analysis and/or inspection (columns 6-10); and a computer (75, 76) to retrieve the selected stored image upon instructions from a user/operator to perform image analysis to locate and identify any defects on the edge of the wafer (columns 6-11). Tsuji also discloses the method of operation including setting desired angles of the image capturing device relative to the edge of the wafer (Figures 2, 6, 10), magnification of the device, focus of the device, brightness of an illumination source, and the rotational speed of the wafer (columns 4-7). The Tsuji' s system inherently performs the claimed method steps.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 3, 5-7, 10-15 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji 6,906,794.

With respect to claims 2 and 3, although Tsuji fails to specify whether or not the microscope of the image capturing device including the use of a scanning electron microscope, the use of a scanning electron microscope for capturing image in an optical inspection system in order to provide better image information/data would have been known in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly in order to provide more accurate inspection results from the system. The further inclusion of setting an accelerating voltage of an electron beam would have also been obvious for similar reasons set forth above.

With respect to claim 5, although Tsuji lacks a clear inclusion of scanning the edge of the wafer from a region interior of a top to a region exterior of a bottom of the edge, selecting a specific manner for scanning an object to be inspected or a wafer for providing a specific pattern of image to be taken by the image capturing device would have been obvious to one of ordinary skill in the art. It would have been obvious to modify Tsuji accordingly in order to provide a better image pattern to be recorded or stored or displayed, if so desired.

With respect to claims 6 and 7, although Tsuji lacks a clear inclusion of comparing the previous defect information to the after defect information to locate any added defects and/or any repaired defects, repeatedly inspecting the same area or

portion of an inspected object or wafer for ensuring a complete inspection performance would have been obvious to one of ordinary skill in the inspection art. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly in order to provide a more reliable inspection performance of the system.

Regarding claims 10-15, although Tsuji discloses different scenarios during the operation of the system but lacks a clear inclusion of an inspection during fabrication of integrated circuit components on the wafer, and a plurality of inspection stations within the fabrication system, it would have been inherently included ("defect inspection is executed in each manufacturing step", columns 1-2; "the wafer edge portion entirely comes within the field of view of the objective lens", column 5; "the related defect data and the image data are preferably stored. The defect data and the image data may be used in subsequent inspection", column 6), however, if not, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly in order to provide a faster production line for making a semiconductor wafer. The further selection of a recorded image or images the associated defect determination would have been obvious to one of ordinary skill in the art for similar reasons set forth above.

Regarding claims 17-20, the inclusion of a second image capturing device would have been an obvious aggregation to one of ordinary skill in the art, thus, it would have been obvious for one of ordinary skill in the art at the time of the invention to modify the proposed system of Tsuji, discussed in the discussion of claims 10-15 above, for similar reasons set forth above. The inclusion of the determination of any added defects and/or

repaired defects would have been obvious for similar reasons set forth in the discussion of claims 6 and 7 above.

**(10) Response to Argument**

The brief, page 11, argues that the Tsuji reference does not teach or suggest the limitation of "positioning the image capturing device at a desired angle relative to the edge of the wafer", this is found no persuasive because at least in column 7, Tsuji states that "the objective lens may be moved to the position located above the wafer edge portion". The image capturing device, of Tsuji reference, comprises an imaging device 100 capturing image data through an objective lens 60, hence, the moving or positioning of the objective lens is the moving or positioning of the image capturing device and the position located above the wafer edge portion is a desired angle relative to the edge of the wafer. In addition, in column 8, Tsuji discloses "(W)hen the imaging device 74 is moved closer to the wafer 2". Thus, the Tsuji reference does disclose the feature of "positioning the image capturing device at a desired angle relative to the edge of the wafer" as claimed by the present application.

The brief, on pages 11-12, argues that because the Tsuji reference uses a joystick pointing device 50 to control the position and rotation of the components/devices and thus, the image capturing device is not be able for "automatically generating an image of the edge wafer" as claimed, this is an incorrect

conclusion because the pointing device 50, at least disclosed by Tsuji, is used to control the movement of the system's stage 30 and/or to control the rotation of the rotatable table 21 of the system but NOT for controlling the operation/performance of the image capturing device (see columns 5-6 and figures 2-3). There is NO indication of whether or not the imaging device or camera 74 of Tsuji is operated directly by a user or operator. Instead, at least in columns 8-10 and the related illustration figure 6, a wafer edge inspection system, according to Tsuji reference, includes an imaging device or a movable camera, even a time delay camera 74 connected to an edge defect processing section 75 having an image memory and a main control 76 such as CPU for further processing the image signals from the imaging device and the desired operation/performance of the Tsuji system. Referring to operations/performances of the imaging device, Tsuji discloses that "the imaging device 74 captures images of the wafer edge portion of the wafer when this wafer 2 is rotated at a constant speed by the aligner" and the "images are captured at arbitrary angle" (column 10), which at least indicative that the imaging device or imaging capturing device is automatically generating images of the inspected wafer or the operation/performance of the imaging device is controlled/activated by another device such as the aligner but not any (manually) requirement such as a human or user interface. Thus, the Tsuji reference does disclose the feature of an imaging device for automatically generating an image as claimed.

The brief, on pages 12-13, argues that since Tsuji reference only disclose the use of stored related defect data and the captured image data for subsequent inspection, column 6, and a comparison of the captured image data with image data of a good quality wafer, therefore, it would have not been obvious to modify the disclosure or the teaching of Tsuji, as found motivation from the examiner, by including a clearly discussion the method steps of comparing the defect information (data) recorded (stored) after each processing step to the defect information recorded from other processing steps and that any of added defects and/or repaired defects can be identified, this is not found persuasive because Tsuji system determines kinds of defects, number of defects and/or coordinate positions of the defects on each wafer in its operation/performances (columns 8-10), thus, the obviousness for a proposed modification, suggested by the examiner, based on the already available operation/performances such as using related defect data and the image captured data for subsequent inspection and comparison of defect data or image data would have been reasonable and/or favorable to one of ordinary skill in the wafer inspection art. Thus, the rejection set forth by the examiner is proper.

The brief, on pages 13-14, argues that the Tsuji' system appears to disclose a manual operation/performance but not automatic operation/performance. As per the discussion and/or response above regarding the automatically operation/performances of the Tsuji' system, it is noted that in columns 8-10 and the at least related figure 6 of Tsuji reference describe a structure of a wafer edge inspection system comprising: an

imaging device capturing images of the wafer edge portion of a wafer when the wafer is rotated at a constant speed by an aligner, an image memory 77 which stores image data or image signals from the imaging device 74, a defect detecting section 79 comparing the captured image data with the good-quality image data for determining defects, a good-quality image data memory, a display section, etc. whose are controlled by a main controller or computer 76. Thus, it appears that the imaging device is automatically inspecting or capturing image as soon as the wafer is rotated at a constant speed by an aligner, and the memory is (automatically) stored image data in accordance with a command from the main controller but not by a human or user interface. Thus, the Tsuji reference discloses the claimed features.

The brief, on pages 14-15, argues that since the Tsuji reference does not clearly disclose or suggest the operation of "correlating each recorded image with the wafer from it was taken and the process step after which it was taken", therefore, the claimed invention would not be obvious to one of ordinary skill in the art for a proposed modification suggested by the examiner, this is not found persuasive because the Tsuji reference discloses the related defect data and the image data are preferably stored and may be used in subsequent inspection (column 6), and also, image data regarding positional information of the defects may be displayed on a wafer map, and the kinds of defects may be indicated in different colors so that it is possible to visually recognize what kind of defect the wafer has, locations, areas or sizes of the defects (columns 9-10). In addition, at least in figure 5 and the corresponding discussion columns 6-7, of

Tsuji reference, disclose an operation screen which can display which portion of the wafer is being observed at the present time while a portion of the wafer with defects detected by the image processing is also displayed on the wafer map. This performances of the operation screen are considered similar to the correlating operations/performances claimed by the present application. Thus, the obviousness and proposed modification suggested by the examiner is proper an favorable to one of ordinary skill in the wafer inspection art. Accordingly, the rejection set forth above is proper.

The arguments regarding dependent claims, on page 15 of the brief, are also included in the response set forth above.

The brief, on pages 15-16, similar to that on page 11 of the brief, argues that the imaging device of the Tsuji' system is fixed and can not be set, this is not found persuasive because it is clearly stated in columns 7 and 8, respectively, of the Tsuji reference, that "the objective lens may be moved to the position located above the wafer edge portion" and "the imaging device is moved closer to the wafer". Thus, the rejection set forth above is proper.

The brief, on page 16, similar to that on pages 12-13, argues that since Tsuji reference does not teach or suggest the feature of identifying process-induced edge defects from the determined difference between the first and second sets of defects, therefore, it would have not been obvious to one of ordinary skill in the art to modify the

Tsuji reference as suggested by the examiner, this is not found persuasive because Tsuji did disclose the determination of kinds of defects, number of defects, coordinate positions, areas and sizes of the defects and even classification and display the defect data in different colors according to their kinds (columns 9-10 and different defect data being display as shown at least in figure 7), however, Tsuji lacks a clear inclusion of the exact manner how the above mentioned determination being achieved. It would have been obvious to one of ordinary skill in the art that for achieving the above mentioned determination, there should be comparison performances and or correlating operations among the defect data being done so that characteristics of differences among the defects and/or set of defects would became parameters for determining the intended kinds of defects, areas and/or sizes of the defects. Thus, it would have been obvious and favorable to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly in order to provide more reliable results from the determination performances of the system.

The brief, on pages 16-17, argues that Tsuji reference cannot be obvious to modify, as suggested by the examiner, for being lack a clear teaching of selecting recorded images by specifying the process steps after which each selected image was taken and determining whether any defects were added to the edge of the wafer. Similar to the response above, although Tsuji lacks a clear inclusion of "selecting" and/or "specifying" operation for the defect data as claimed, Tsuji does disclose the operation/performances of: comparing the defect image data, updating defect image

data after sequent inspection performances, classifying and displaying defect data according to their kinds, positions and/or sizes, wherein those operations/performances would have obviously been inherent selecting and specifying performances as claimed. Note that kinds of defect data, sizes and their corresponding position on a particular inspected wafer are classified and displayed accordingly as being shown in figure 7 and discussed in columns 9-10. Tsuji, however, lacks a clear inclusion of whether or not the selecting and specifying performances being done from a particular recorded image and wafer and so that any further defect data being recognized. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly in order to provide a more accurate inspection result from the system.

The brief, on pages 17-18, similar to the above, argues that Tsuji reference cannot be obvious to modify, as suggest by the examiner, for lacking a clear teaching of determining any further defects being added or have been repaired on the inspected wafer which are performed by a computer. Tsuji' system includes an edge defect processing section with a computer or CPU as a main controller for classifying, displaying defect data but lacks a clear function of recognizing any further defects as added and/or repaired defects. Assigning desired processing loops for a programmable computer and/or CPU for performing intended data processing would have been obvious to one of ordinary skill in the computer art. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Tsuji accordingly so that the inspection result from the system can be accurately achieved.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Que T. Le

Conferees:

Georgia Epps

Ricky Mack